



Challenges and Opportunities for Improving Rural Energy Services in Karnataka

A Policy and Program Framework for the PRESK Cell

October 29, 2004

Prepared by



Contract No. 386-C-00-03-00135-00

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Executive Summary & Overview of Recommendations

Programs for rural electrification reform in India have focused mainly on conventional measures such as unbundling supply, installing meters, reducing subsidies, and privatization. In Karnataka, in 2002, senior officials from the Department of Rural Development and Panchayat Raj (RDPR) and the Department of Energy (DOE) began to consider new approaches that would be consumer-based and decentralized, working through the locally elected grama panchayat councils (GPs). The USAID-funded South Asia Regional Initiative for Energy Program (SARI/Energy) learned of these initiatives, and, following discussions and a joint design effort, SARI/Energy undertook what became an 18-month collaborative pilot program, called Participatory Rural Energy Services for Karnataka (PRESK). The PRESK Pilot has worked directly with GPs and farmers, addressing improvements in rural electricity services together with issues of groundwater depletion, improved farm management and broader aspects of rural development.

As the Pilot Program under USAID funding came to a close, the USAID transferred the PRESK strategy and program into a newly formed PRESK Cell (PC) by the Government of Karnataka (GOK). The PC is to be based within the Mahatma Gandhi Regional Institute for Rural Energy Development (MGRURED), which has recently been reconstituted as an independent society. The MGRURED PC (MGIPC) is expected to play a central role in RDPR's 2005 campaign to provide capacity-building and technical advisory services to GP members statewide. The MGIPC will continue PRESK's efforts to address issues of rural energy services, groundwater management, and rural development.

PRESK's work to date has contributed to understanding of these issues, to identifying effective responses, to building local management capacity, and creating channels for continuing collaboration between farmers, local governments, energy service companies (ESCOs), and central government agencies. The GOK's initiative to take "a participatory path" now seems to have been prescient; it is firmly reinforced by the new Union and Karnataka state governments' Common Minimum Program and India's national recommitment to developing the rural economy.

As PRESK moves into its "second generation" work through the MGIPC, it is timely to consider the key development trends and context in which the MGIPC will be working, and to propose priorities for its policies and programs. This paper is intended to do that.

Part 1 reviews the need for rural electrification, and for rural electrification reform. Part 2 examines key trends that are driving Karnataka's rural economy and rural electricity service. Part 3 describes how the PRESK Pilot Program has tried to respond to some of those forces. And in Part 4, an action agenda for next-generation PRESK work through the MGIPC with GOK support is outlined through a series of nine "recommended next steps."

In summary, those nine recommendations are:

- *Farmers and ESCOMs need better information services:* All of the PRESK training and information services including the Resource Center, the Web Site, Farmer-to-Farmer sharing, educational materials and training courses should be integrated into the new MGIPC. The immediate priority will be to support RDPR's program to provide PRESK training to all GPs statewide beginning in early 2005.

- *The GOK and public need integrated information and analysis of rural development issues:* RDPR should use the MGIPC for Rural Development Resources Assessment (RDRA), focused on electricity services, groundwater depletion, and related rural development issues.
- *Leverage the synergies in co-management of water and energy:* The MGIPC should set an agenda for energy-water synergy research, aiming to complete at least one significant applied research program on these issues each year.
- *Continue the decentralization of rural electricity services:* The MGIPC needs to follow through on implementation of the draft PRESK MOU with at least one GP or a set of GPs. They will need to work closely with BESCOM and KPTCL to assure that the necessary upgrades are made for the distribution system in the areas handed over, and to assure provision for secure and adequate power supply.
- *Improve local T&D efficiency:* As GP-level PRESK MOU projects materialize, the MGIPC should work with the ESCOM and the GP to establish District Level Technical Support Groups to advise on priorities for maintenance and expansion.
- *Develop effective local water management units:* MGIPC should work with interested GPs to establish GP committees dedicated to productive and equitable water use and conservation in their communities.
- *Promote distributed generation:* The MGIPC should play a leading role in monitoring and promoting distributed generation projects in rural areas.
- *Facilitate local investment in small-scale infrastructure:* Building on the work begun under the PRESK Pilot, the MGIPC should work with the Small-Scale Sustainable Infrastructure Development Fund (S3IDF), central authorities, and local financial institutions to promote awareness of innovative financing techniques and priority financing opportunities in the local energy market.
- *Shift to smarter subsidies:* MGIPC should be made the GOK's focal point for monitoring and analyzing the impacts of energy and agricultural subsidies, and for policy research on improving these subsidies and their delivery.

1.1 The Social Contract

Access to modern energy, particularly to electricity, is essential for rural development. Whether used to replace kerosene lamps for better household lighting, to cool milk at a dairy cooperative, refrigerate vaccines at a village clinic, or to pump water for irrigating a farmer's crops, the availability of electricity makes dramatic changes in the lives of rural people. Electrification correlates closely with economic growth, alleviation of poverty, educational achievement, advancement of women, and environmental quality. If rural people are to progress and prosper, they must have access to electricity.

Most people in rural India, however, are poor, living on less than Rs 100 per day. One of the fundamental dilemmas of poverty and development is the need to provide electric power to those who can least afford it. So it is important to keep in mind that the benefits of electricity accrue not only to the individual consumer, but also to society as a whole to the entire economy.

But electricity is infrastructure-intensive and, therefore, capital-intensive. Generators, transmission towers, substations, and local distribution lines are needed to produce and deliver electricity to the consumer, and even then it is useless until the consumer invests in the appliances that convert the electricity into useful light, heat, or power. If produced on site using renewable sources, the relative costs of the capital investment may be even higher.

In a densely populated urban area, distribution costs are lower and there are many consumers generally with higher incomes and higher demand to share the costs. The more rural and poorer the community is, the higher the cost of extending the grid or providing decentralized generation, and the less able the potential customers are to pay front-end costs. As a consequence, electricity service providers (ESCOs), whether public or private, have little incentive to invest in the infrastructure needed to provide energy services to the rural poor.

Again, the benefits of electricity accrue not only to the individual consumer, but also to society as a whole. This is the basis for the social contract of subsidies, or public investment in rural electrification. Public support was used in the United States in the 1930s, for the world's first national rural electrification program, and has been a basic component of rural electrification ever since, worldwide. The issue is not whether to subsidize, but how much, how, and for how long, and perhaps most troublesome, how to keep what begins as a reasonable social bargain from getting out of balance.

In India, the social contract of public rural electrification support has, over time, slipped badly out of balance. Especially in rural areas, electricity consumers, people, businesses, and government agencies face chronic power cuts and fluctuations. India's electricity transmission and distribution systems are characterized by high losses that are estimated to cost the nation as much as Rs 40,000 crores (US\$9 billion) annually. With such poor service at such high cost, reforming the electricity sector is a high priority for both central and state governments.

The SEBs are for all intents and purposes bankrupt, losing \$6 billion a year. Electricity theft and non-payment is as high as **50%**, and technical losses are in the **40-50%** range, leaving very little power, which is actually paid for. While reforms have been proposed, civil society groups and utility workers' unions oppose many of them. In 2000, power subsidies reached \$5.8 billion, equivalent to **1.3%** of India's GDP and nearly twice the amount the country spends on health care. Most farmers have come to believe that electricity is a public good that should be provided freely or cheaply by the government.

How did this situation arise? Karnataka's case is representative of what has occurred nationwide, and it is worth reviewing the state's experience.

1.2 Karnataka's Experience

In 1902, only 20 years after Thomas Edison opened the world's first commercial electric power station in the US, a commercial hydroelectric station began generating power from the Cauvery River at Shivasamudram. That project, the first commercial hydroelectric plant in Asia, provided power to the gold mining operations at Kolar, also giving Karnataka the distinction of having the world's longest and highest voltage transmission line at the time.

Shivasamudram's capacity was expanded, and an additional hydroelectric station was commissioned at Shimsha in 1940. The availability of power stimulated development of industry, and new industry demanded more power. Urban and rural areas also began to be served. With inexpensive hydropower and related infrastructure, Karnataka was attractive to industry. As demand for industrial, urban, and rural use increased, additional hydroelectric dams were constructed in the 1960s and 1970s.

This new energy raised new development opportunities, but was not without problems. Hydroelectric dams affected river flow, drowned rich natural forest areas, and displaced villages. Also, reliance on hydel power meant reliance on the annual monsoon, something that is not within the reliability standards of modern industry or other power consumers. So, the state began to diversify; the first thermal plant came on stream in 1984, and interconnections were made to import and exchange power with neighboring states.

Prior to independence, private companies and local authorities managed most of the power generation in the state. Shortly after Independence, under the federal Electricity Supply Act of 1948, all generation, transmission, and distribution activities were placed under the responsibility of the individual state governments. By 1957, Karnataka, like other states, had organized these activities into a vertically integrated utility monopoly, the Mysore State Electricity Board (MSEB). Also as in other states, financing for the MSEB came from long-term, low-interest loans from the state treasury. And, as in other states, a basic cross-subsidy was instituted: industrial and commercial consumers were charged a tariff above the cost of production and delivery, while agricultural and household consumers were charged a tariff below cost.

Thus Karnataka's electric power industry like that of the rest of the country grew up with four basic characteristics: (1) it was based on centralized supply and grid expansion; (2) state budgets funded large investments at low cost; (3) generation relied on indigenous resources, rather than on imported fuels; and (4) rural users, and to a lesser extent urban households, were subsidized by industrial and commercial users. These characteristics allowed major

growth and development of electricity services; they also led directly to the sector's current crisis. It is fair to say that the SEBs were financially dependent on the state, and that they had little, if any, incentive to achieve efficiency or focus on customer service. And while the costs of producing, transmitting, and distributing power would rise over time, farmers, who quickly came to accept their subsidized rates as normal and proper, were an increasingly large block of customers and recognized by politicians as an increasingly influential block of voters naturally opposed to any increase in the tariffs they were asked to pay.

Until 1986, the Karnataka Electricity Board (KEB) operated in the black. Since then, as also occurred in other SEBs from about the same time, KEB has incurred losses. While a number of issues, such as technical and commercial inefficiencies, were factors, there is little doubt that the major cause of these losses was the increasing level of agricultural consumption for which KEB could not recover anything near full costs.

In 1991, as part of major economic reforms enacted by the Union government, the national Electricity Law was amended to encourage new investments in generating capacity by independent power producers (IPPs), both foreign and domestic. It was hoped that IPPs would bring with them innovations in technology, inputs of private capital, and competition. Karnataka invited IPPs to propose projects, and quickly established itself in the ranks of leading power sector reform states¹. But KEB's limited ability to co-finance new projects proved to be a constraint, and most IPP projects floundered because of the increasing discrepancy between service costs and the ability to charge and receive tariffs. The already unviable situation for rural payments-service-subsidies was given an additional burden in 1993, when then CM S Bangarappa announced that farmers owning irrigation pump sets (IPs) up to 10 horsepower would not have to pay for power at all. At the time, the annual rural electrification subsidy was less than Rs 50 crores. And IP sets were still relatively limited in number, possessed only by a relatively few, but influential, farmers.

In 1993, World Bank introduced its new policy for lending to the Indian electricity sector and it would henceforth only support those states that were committed to reform and restructuring. The World Bank's decision, while controversial, reflected the concerns of many Indian as well as international power industry experts. Principal efforts of the new reform agenda were to:

- unbundle the integrated state utilities into distinct generation, transmission and distribution entities;
- privatize generation and distribution;
- establish independent regulatory commissions to regulate these utilities; and
- to reform tariffs at all levels bulk electricity generation, transmission, and retail.

In 1999, the GOK enacted the Karnataka Electricity Reform Act (KERA), which:

- established an Electricity Regulatory Commission;
- converted KEB into a distinct transmission company, and several regional energy service or distribution companies (DISCOMs or ESCOMs);
- mandated eventual privatization of these ESCOMs; and
- continued to promote investment by Independent Power Producers (IPPs).

¹ Together with the states of Orissa, Haryana, Andhra Pradesh, Uttar Pradesh and Rajasthan.

The State quickly completed the first two objectives, and the fourth is on going. The Act came into force from June 1999. The Karnataka Power Transmission Corporation Limited (KPTCL) was established in the end of July, and the Karnataka Electricity Regulatory Commission in September. In June 2002 four DISCOMS were created, all fully owned by the government, but with clear intention to privatize as soon as feasible.

Both KPTCL and the new DISCOMs benefited from balance sheet restructuring plans (BRP-1, II & III) provided for under the reforms. These BRPs wrote off or transferred loans and power purchase dues to the GOK as an adjustment against accumulated power sale and subsidy receivables. As these were write-offs and low-interest loans, they may fairly be considered as subsidies to the new companies. In addition, the state's reforms included signing of a memorandum of agreement (MOA) with the Government of India, which committed it to specific reforms within a scheduled time frame in exchange for technical and financial assistance from the central government.

1.3 The Present Situation

Today, there are 10 million customers from all categories in the state. Approximately **30%** of these are unmetered accounts: irrigation pump sets and *bhagya jyothi* (below poverty level household) installations. At present, only **75%** of the rural population has access to electricity, while the figure is about **90%** for the state as a whole. More than 14 lakh irrigation pump sets owned by rich and mid-level farmers consume **41%** of the state's power. But the revenue realized amounts to only **6.32%** of total collections. Commercial losses due to theft, pilferage, unpaid bills, etc. are estimated at about **25%** statewide.

The GOK is paying about Rs. 1,500 crore annually as power subsidy for agriculture, while outstanding payments to KPTCL amount to approx. Rs. 3,500 crores.²

Rural customers in Karnataka typically receive electricity that is below the rated frequency and voltage. This poor quality power stresses to irrigation pump sets and other appliances. The timing of their power supply is also unreliable, especially when there is "unofficial" load shedding during peak hours in summer time. The reasons this service is so poor are well recognized: the ESCOMs have inherited aging distribution networks and obsolete technology, as well as poor capacity for customer service, and various internal management constraints.

Aside from the heavily subsidized tariff rates, most farmers are further subsidized by simply failing to pay their monthly power bills. On two occasions over the past decade, chief ministers have waived past-due electric bills. So most farmers do not pay their current bills. They can safely anticipate that, eventually, their arrears will again be dismissed. This situation has now reached the point where farmers owe in excess of Rs. 1,000 crores in unpaid electric bills, with no end in sight. Despite such subsidies and arguably because of them, power access and reliability and, consequently, overall rural economic growth, lag far behind their true potential.

² Sowmya Aji Mehu, "Free Power, But At What Cost?", Times of India, June 7, 2004

2.1 Water, Energy, and Karnataka's Agriculture

Karnataka is a state of great geographic and economic contrasts. Within India, it is second only to Rajasthan in area of desert and arid land. Yet the plateau containing Mysore and Bangalore receives the benefit of both the southwest and northeast monsoons, and has long been known for its intensive management of agricultural water; its ancient tank and irrigation system, centered along the Cauvery and other major rivers, kept the kingdoms of Mysore notably free of famine for many centuries.³

Water management for agriculture in the area goes back at least 2,000 years. Main streams, including the Cauvery itself, supplied an extensive irrigation system by means of channels drawn from large dams or anicuts (submerged dams that raised the water level but allowed the river to flow overtop). Similarly, streams in the hills were embanked to form series of reservoirs or tanks, with the outflow from the highest supplying the next lower, and so on, all down the course of the stream. These tanks, at least 20,000 of them, vary in size from small ponds to the 10-mile long Sulekere Lake.

Karnataka's 35 million farmers still rely on water-intensive agriculture. But now, instead of sustaining themselves from the seasonal flow of local rivers and their networks of tanks, they rely on intensive use of electrically powered borewells.

First introduced in India in the 1970s as a new tool in the Green Revolution, diesel and electric irrigation pumps have revolutionized every aspect of rural development in Southern India. Pump sets enable farmers, wherever they are fortuitously located, to tap into the buried treasure of underground water.

Worldwide, it is estimated that mankind can now tap 100 times more water below ground than flows above it.⁴ Groundwater cannot evaporate or escape. It liberates drought-struck farms, on demand. It is comparatively egalitarian since savings or moneylenders can quickly finance the pumps to tap it. It contributes more to agricultural wealth than any other source; it offers revenue, stability and equity to those who tap it.⁵

Thus groundwater irrigation has surpassed surface water in domestic consumption,⁶ horizontal acreage, crop per drop, harvest and yield per hectare.⁷ It now supplies 60 percent of India's irrigated area, directly contributing to 11 percent of national GDP.⁸ In just two decades, one out of five South Indian farmers have sunk \$12 billion of their own (or borrowed) money into borewells and pumps.⁹ In Karnataka alone, 100,000 new, ever deeper, wells are drilled each year.¹⁰

³ With the one notable exception being the great calamity of 1876-1877, when one-fourth of the population is believed to have perished.

⁴ Weiss, R. March 10 2003. *Water Scarcity Prompts Scientists to Look Down*. Washington Post p.A 11.

⁵ Moench, Marcus. 2000. *Groundwater and Society: Resources, Tensions and Opportunities*. United Nations.

⁶ WANEXA Governance PDF PowerPoint Presentation.

⁷ Shah, T. et al. 2002. *The Socio-Ecology of Groundwater in India*. IWMI-Tata presentation for WSSD.

⁸ World Bank estimates 2002

⁹ Shah, T. 1993 *Water Markets and irrigation development: Political economy and practical policy*. Bombay: Oxford University Press

¹⁰ Govt. of Karnataka, 2000 *Karnataka Agriculture – A profile*, Dept of Agriculture,

Like any buried treasure, however, groundwater is not limitless. Groundwater may be geographically and seasonally convenient, but tapping it is becoming possible for progressively fewer farmers. For centuries, any human, sometimes drawing on animal draft, could lift it from a shallow well of 1-5 meters. In the 1970s, cheap centrifugal pumps reached 10 meters. But by the mid 1980s, as motorized pumps increased in power and number, water tables sank to 50-150 meters depth.¹¹ Today, those farmers who can afford them rely on expensive motors and power, and one third of India's electricity is devoted to hoisting water.

Ironically, Karnataka produces **35%** of its electricity from water in rivers flowing downhill, but consumes **42%** of its electricity to lift water back up hill through 1.4 million irrigation pump sets.¹² Across South Asia, an estimated 29 million electric IP sets burn \$9 billion of electricity per year to pump 210 cubic km water for irrigation.¹³ Dams harness moving water to release energy; pumps harness that energy to release moving water.

As a further irony, groundwater pumping rates increase sharply when rainfall, and hydropower, is less than 'normal.'¹⁴ Reducing water flow by half cuts energy generation by three quarters. In drought-struck Karnataka during the dry season of 2003-2004, lost stream current translated to lost electrical current of 4,000 million units,¹⁵ or 1/7th of supply, just when 1.4 million IP sets were frantically demanding it at full capacity to compensate for the lack of rainfall.¹⁶

2.2 Synergy Issues

Beyond irony, these interactions between electricity and groundwater have profound impact on Karnataka's farmers and the rural economy. Because they are so inextricably inter-related, they need to be considered as the synergistic issues they are.

■ Synergy Issue No. 1 - Electricity availability increases groundwater use

Without considerable power, water more than a few meters underground cannot be tapped. Solar-powered pumps are strong enough to pump from depths of several tens of meters, but they require high insulation rates to operate, and a substantial up-front capital cost. In other parts of India, diesel-powered pumps are commonplace. But in Karnataka diesel is markedly more costly than electricity; and unlike electricity, must usually be paid for in advance. So, without access and availability of electricity, it is safe to say that Karnataka's agriculture would still necessarily be confined to surface water flows.

■ Synergy Issue No. 2 - Groundwater use increases energy demand

Water is heavy; a cubic meter weighs a ton. And wherever it is being drawn from the ground faster than natural replenishment can occur, each cubic meter pumped lowers the groundwater table, requiring even more energy to lift the next cubic meter from even greater depths. Also, the increasing strain on aging pumps lowers pump efficiency; "de-rating" or declining efficiency can fall from **75%** to **15%** within just a few years

¹¹ Reddy & Gopal, Sept 2002. in *Social Assessment of Agriculture Consumers: KPSR&PP* p.78

¹² Howes, Stephen, Murgai, Rinku. 2001. *Karnataka: Incidence of Agricultural Power Subsidies. An Estimate*. Economic and Political Weekly.

¹³ T Shah, C Scott, A Kishore, A Sharma. 2002. *Energy Irrigation Synergy in South Asia: Approaches to Agrarian Prosperity with Viable Power Industry*,

¹⁴ USAID/India: Best Practices in Rural and Agricultural Delivery, A manual, August 2003

¹⁵ Interviews with VSRao.....and Vijay Kumar.

¹⁶ Gopinath S. 2004 *Karnataka Rural Energy Services*. USAID Partnership. Background note. nRG

especially when the power supply is unsteady and generally under-voltage again increasing the amount of electricity consumed to lift the same volume.¹⁷

▪ **Synergy Issue No. 3 - Cost of groundwater is a function of the price paid for electricity**

Groundwater in India is still a “free” resource. So its cost is simply a function of the cost of accessing it: drilling the borewell, buying and installing a pump – and maintaining it plus the cost of the power to run the pump. When a farmer doesn’t pay for the power, or only pays a very low rate for it, the odds are that the power voltage is so low that it is burning out the pump motor frequently, as noted above. So he saves on electricity, but pays more for maintenance and replacement.

▪ **Synergy Issue No. 4 - Failure of either resource - electricity supply or groundwater causes rural economic collapse**

Karnataka has been mapped into 218 watersheds, and the balance of inflow and recharge has been assessed for each.¹⁸ ‘Overuse’ is classified as: Intermediate, Grey and Dark, where **50- 65%**, **65- 85%**; and more than **85%** of the annually replenishable resource is abstracted, respectively.¹⁹

The Karnataka State Water Department reports that, “In ... 72 critical taluks (43 are “over exploited” and 29 exploitation exceeds **50%** of recharge) ... Due to over exploitation of ground water resources, more than 3 lakh dug-wells have dried. Shallow bore wells have failed and yield in deep bore wells are declining. Area irrigated by ground water extraction structures is decreasing. Consequently, more than Rs.2000 crores of investment made by the individual farmers on the construction of wells, pumping equipment, pipelines, development etc.,” has been lost.

Farmers know that groundwater tables are dropping fast, yielding flows more reluctantly.²⁰ But they lack any will, capacity or incentive to stop. Given the continuing central supply of unquantified energy supply there is no short-term reason to exercise restraint.²¹ Economic logic low marginal cost and high marginal returns dictates that they *must* chase groundwater down even as it rapidly recedes away from them.

In fact, the only economic forces restricting demand are lack of opportunity or supply. Constraint comes not through consensus or regulation, but by default. Default takes two forms: energy supply failures limit a farmer’s ability to pump water; aquifer supply failures limit the water he is able to pump. Both failures threaten large numbers of farmers in Karnataka.

Traditional muscle-driven water-lift farmers were long ago left “high and dry” as tube wells, owned by better off farmers, sucked the water right out from under the traditional farmers’ feet. New siting and licensing policies reinforced the rights of the early tube well owners and exclude latecomers, who are, again, typically poorer. Next, even those who could afford to chase the sinking groundwater tables down meter by meter started to lose money and water;

¹⁷ USAID/India. August 2003. *Best Practices in Rural and Agricultural Delivery*, A Manual.

¹⁸ Karnataka Government Website <http://www.kar.nic.in/watershed/about.htm>

¹⁹ All PRESK taluks are in the ‘dark’ category: Stephens, J., 2003. *First Report for PRESK on Water-Energy Synergy* USAID/SARI-Energy.

²⁰ Stephens, J. 2004. Farmer Survey in Chintamani. PRESK. USAID/SARI-Energy

²¹ Nexant PRESK: Technical Assistance Report on Activities. Lessons Learned, p. 4-2

they went in debt to drill still deeper, and pump still more. As they grew addicted, well failure in south-central India has reached more than 60 percent in some regions. Strike rates of newly drilled borehole wells have declined from **60 %** to **22 %**.²²

2.3 Related Trends

Of the myriad forces that contribute to the daily evolution of development in rural Karnataka, several stand out as key drivers of trends and events. Certainly, the two issues of groundwater depletion and of adequate and affordable electricity supply count among these. Before turning back to these two core issues, it is worth noting several other factors that profoundly affect both groundwater and rural electricity, and all aspects of rural development. These are: growing population pressure, general economic growth and urbanization, climate change, and rural governance.

To a certain extent these issues can be tracked and reported by statisticians and planners. But their dimensions are often complex, diffuse, or too imprecise to fit into neat tables or equations. They are, however, reflected in daily press reports, and in conversations with farmers, rural entrepreneurs, government officials, and academic observers.

Over the next 5-20 years, each of them individually will have a profound impact on rural electrification, on agricultural livelihoods, and on the general economic welfare of people in rural Karnataka. All six issues taken together, point to some alarming trends.

■ **Growing Population Pressure**

Karnataka's population, currently 54 million, will rise to about 62 million by the year 2010. The rural population will rise from about 35 million to over 40 million, even allowing for continued rapid urbanization. One of the impacts of growing rural population is increasing pressure on agricultural land. In 1970, only **30%** of Karnataka's farm families had less than 1 hectare of land. By 1990, this figure had grown to **42%**. A reasonable estimate would be that nearly half of all farm families today have less than a hectare to farm, and the trend is continuing. As farm size drops below a hectare, it generally becomes marginal, or uneconomic. Most such farms end up being sold, with the farmer and his family forced into the ranks of landless laborers. And of course, this is only the lower tier of the farm scale. Fragmentation is occurring among all categories of landholders – large, medium, small. The greatest pressure may in fact be on mid-sized farmers; these farmers have an ability to borrow and go into debt that small farmers do not have. If their crops or wells fail, their debts are likely to go into default, and the farmers themselves go into despair.

■ **Economic Growth, Industrialization and Urbanization**

Although there is a wide economic gap between the “Indian Silicon Valley” of Bangalore and Karnataka's rural hinterlands, the state as a whole has done relatively well for several decades. Real per capita incomes have been averaging more than **3.5%** annually since 1980. In recent years the GOK has targeted and achieved annual economic growth at **8%**. But at a current elasticity of 1.5, that means that power growth must maintain **12%**, every year. Economic growth is a basic objective for everyone. It comes from more population, more agricultural production, and more industry and urbanization. Growth in output and

²² Palanisami, K. Chandrasekaran B. 2003 Water Resources and Management: Questions and Answers. KPWRCT/NAU

income can come from increased efficiency, but in general means increased consumption of energy, water, and other resources.

■ **Changing Crop Markets**

India's agriculture, long protected and bound by tradition, is now pressed by population growth, rising costs, uncertain monsoons, corporate investors, and trade liberalization. It is characterized by small farm size, high production costs, and low yields. Competition within India is keen; opening to global trade has been devastating to some sectors. Karnataka's silk industry has been decimated by Chinese competition. For vegetable oils, India was self-sufficient a decade ago and world prices high. But world prices have fallen, and lower cost oil from Malaysia, Indonesia, the US and Brazil has taken **40%** of the market. Indian consumers benefit, but Indian farmers do not. In Karnataka alone, more than 100 out of 115 oil mills have closed.²³ From extensive farmer survey work conducted under the PRESK Pilot, it appears that a full **30%** of farmers within a typical taluk are not generating sufficient income to service loans from moneylenders or to pay their current electricity bills. The ultimate stress will likely be water supply. Experts project that a quarter of India's harvest and farmers may be at risk from ground water depletion.²⁴

■ **Climate Change**

Although this year's monsoon has been markedly better than the failed rains of the two previous years, there should be no doubt that changes, unpredictable with any precision, are underway in the region's climate in conjunction with climatic changes worldwide. There is increasing cause for concern that these changes mean, at best, greater uncertainty in the monsoons of coming years, and possibly very significant changes in the patterns of their timing and location. Already, the frequency and severity of floods and droughts is increasing in Karnataka, and throughout South Asia.²⁵ In 2002 alone, drought cut Karnataka's hydel power from 30 to 15 million units per day.²⁶

■ **Local Governance**

Karnataka is recognized as a leader in governmental reform and decentralization. The gram panchayats (GPs) are benefiting from the statewide training network established by the RDPR, and are rapidly becoming proficient at managing local affairs, even succeeding at tax collection! This is a very hopeful development, because it is becoming clear that as the rural economy becomes more dynamic, complex, and strained, central authorities are less able to plan accurately, execute efficiently, operate economically, or regulate equitably.

2.4. Crisis Points and Rural Economic Transformation

Change and uncertainty are inherent in human and economic life. But with the possible exception of the demographic factor cited above, none of these drivers has ever proceeded to change as rapidly or as markedly as they are now. Taken together, it appears almost inevitable that several of these trends will converge to pose increasingly serious challenges -- points of crisis for farmers, government, and ESCOMs.

²³ "The farming crisis", Frontline magazine, Chennai, 2 February 2001

²⁴ Seckler, David et al 1998. *Water scarcity in the 21st century*. IWMI Water Brief 2. Colombo, Sri Lanka

²⁵ Lonergan S. 1998 Climate warming and India In *Measuring the Impact of Climate Change on Indian Agriculture*, edited by A Dinar, et al. Washington DC: World Bank. [World Bank Technical Paper No. 402]

²⁶ Financial Daily. Nov 14, 2002 'Metering has built-in subsidy for farmers.' THE HINDU group

These crisis points include:

- As groundwater levels decline, increasingly powerful pumps consuming more electricity must be used to lift the water to sustain crops. As crop prices fall, farmers are less able to pay for pumps or power. There may well be a tipping point where this trend will turn from local to regional agricultural failure. But in the meanwhile, farmers will progressively be marginalized as they lose in the race to pursue the lowering water table.
- As population increases, and farm holdings shrink, the economics of current cropping systems also work against small farmers. As competition continues to force crop prices down, more and more farmers, those with insufficient land and water get squeezed out. They lose their land, and must try to compete as laborers in both agriculture and industry.
- As the government and ESCOMs cope with mounting costs for delivering more and more power to more and more farmers who are unwilling or unable to pay for it, there will come a point where the government will either have to slash subsidies, raise agricultural power tariffs, or privatize the distribution system.
- Meanwhile, cash-strapped ESCOMs already are struggling to purchase adequate power supply from KPTCL, and deliver it satisfactorily through an aging and increasingly inadequate infrastructure, thereby perpetuating the vicious cycle of poor service, poor payment, and increasing distrust between consumers and service providers.

The vicious cycles pushed by these trends are already bankrupting marginal farmers, crippling ESCOMs, dissolving trust between city and countryside, and confounding politicians from the national down to gram panchayat levels. As the general situation deteriorates, it is increasingly likely that the next serious monsoon failure could push the system beyond a tipping point that would wreak havoc throughout the state.

With concerted effort by all the stakeholders – government, farmers, ESCOMs, these pressures can be anticipated and mitigated. In every country that has developed on a large rural population base, similar kinds of pressures have been relieved only through a major transformation of agriculture and the rural economy fewer farms, higher productivity. Industry and service sectors have been growing well in Karnataka. But the added pressure of failing surface waters from climate change, and depletion of underground aquifers by overuse and declining replenishment, will force this transition much harder and faster than it would otherwise be and much faster than Karnataka's industrial and service sectors have performed previously.

3.1 The Pilot Program

In November 2002, representatives of USAID's South Asia Regional Initiative (SARI/Energy) Project began discussions with the Government of Karnataka (GOK) to consider opportunities for collaborating on the problems of rural electricity distribution in the state. Following from these talks, a team of SARI/Energy experts and local counterparts in early 2003 designed the Participatory Rural Energy Services for Karnataka (PRESK) pilot program, an 18 month effort focused on the interrelated problems of poor electricity service, dwindling water resources, and marginal farming practices.

February 2003 – SARI/Energy Design Team Findings:

- There is a “cycle of mistrust” inherited by the new distribution companies; farmers were highly critical of BESCOM services.
- IP user arrears exceeded Rs 1,000 crores, and less than 1% of users were paying their electricity bills.
- Problems of poor quality electricity supply are closely lined to water depletion, and unproductive agriculture was inter-linked, requiring integrated action across sectors and agencies.
- The dysfunctional rural electricity service and payments situation threatens GOK's plans for privatization of electricity distribution and privatization threatens to make rural services even worse.
- GOK's initial strategy in 2002 for GP involvement in distribution was unworkable because of limited understanding or management capacity at the local level.

Four taluks, covering 112 Grama Panchayats (GPs), were selected for the pilot project. The PRESK mission was to work with the GOK and the local electric services company (ESCOM) to establish a positive dialog with the GPs, train GP members in electricity supply support services, and transfer best practices for water and electricity management to the GPs. Because of the regional nature of the SARI/Energy Project, these would include the “best practices” experience for rural energy supply from neighboring SARI countries, to test their adaptability to Karnataka's situation.

From April 2003-September 2004, the PRESK team conducted public meetings, workshops, and training sessions for GP representatives and farmers. SARI consultants collaborated with staff of the Karnataka Department of Rural Development and Panchayat Raj, the Department of Energy, and the Bangalore Electricity Supply Company (BESCOM). They listened to farmers and GPs, and began to suggest solutions, which were discussed intensively by all involved. Representatives from the highly successful Bangladesh Rural Electricity Board (REB) visited Karnataka to show the GPs how rural electricity supply is handled by community cooperatives in that country. Local surveys of water usage and crop revenues were conducted, and a capacity building effort was initiated to train GP representatives on how to manage electricity billing and collections at the local level.

PRESK commissioned Marali Mannige (Back to the Soil), a film in Kannada, the local language, to dramatize the situation farmers face in Karnataka and help motivate the GPs to become involved in self-management of resources. A model “resource center” was established in the taluk of Gubbi to provide farmers with information on water resource

management, improved farming techniques, and electricity conservation. Visits to model farms that are successfully using innovative irrigation, crop management, and electricity generation techniques were arranged for local farmers, who developed a genuine interest in pursuing similar approaches.

Two booklets, one covering improved practices for water in agriculture and the other on “FAQs on Rural Electricity Distribution”, were published in Kannada and made available to farmers and local people. And several technical reviews were prepared:

- Technical Review of investment costs and loss estimation for G.Hosahalli feeder, Gubbi taluk as submitted by 3 EC, in September 2003;
- Study on ‘Metering, Billing and Collection systems in 4 taluks’, August-December 2003;
- Report on ‘Options for System Upgrades in Rural Power Distribution Networks,’ completed in February 2004;
- Review of BESCOM’s “Impact of Rural Load Management Systems in Tavarekere, Magadi Taluk”, undertaken in June 2004; and a
- Survey on “Value of Water in Use in Agriculture”, in Chintamani and Gubbi taluks.

In addition, a new Indo-American technical assistance and venture capital NGO, the Small-Scale Sustainable Infrastructure Development Fund (S³IDF),²⁷ was supported to establish a presence in the four PRESK talukas, where they identified small projects for energy and related infrastructure investments that, relying primarily on local financing, are moving into implementation, with the models established to be replicated and expanded over the coming years.

By September 2004, more than 20 GPs had expressed specific interest in taking over Metering, Billing and Collection (MBC) activities from BESCOM, and 6 GPs had passed formal resolutions to do so. At the GOK’s request, a MOU for collaboration between BESCOM and these GPs to transfer MBC and full distribution service activities was nearing final draft, and it is anticipated that at least one such model agreement will be in place before the end of the year.

Also in September, as the USAID support to the PRESK Pilot Program was finishing, the RDPR announced its intention to “take PRESK statewide”. The PRESK program would be transferred to the Mahatma Gandhi Regional Institute for Rural Energy Development (MGRRED), where it would become a cornerstone of the Departments campaign in 2005 to establish technical support and training to GPs throughout the state on key development issues: drinking water, watershed management, and electricity services.

In a nutshell, PRESK’s program and accomplishments were based on three core concepts:

- empower GPs and farmers with information;
- identifying better practices, field test them, and sharing them broadly; and

²⁷ S³IDF is a transaction-oriented entity whose mission is to facilitate small-scale infrastructure and related investments needed for poverty alleviation and overall economic advancement in the developing world with focus on South Asia. S³IDF is a US-based non-profit corporation registered as a public charity. Its India-based affiliate with the same name and mission was created as a non-profit company under Section 25 of the Companies Act, and is now registered under 80G (charitable organization). S³IDF operates as a social merchant bank providing financing and know-how from its own resources as well as by creating access and linkages to others with necessary know-how, technology and financing. In assisting these providers and their customers, S³IDF collaborates with local partners – activist and business-like NGOs, academic groups, equipment suppliers and others.

- dealing with agriculture, water, and energy issues as a synergistic whole.

3.2 Next Step for PRESK

The PRESK Pilot Program ended on September 30, 2004. But it is expected to quickly reincarnate within the Mahatma Gandhi Regional Institute for Rural Energy Development (MGIRED) as the PRESK Cell (MGIPC).

The Institute currently offers training programs and specialized courses as a Regional Training Center under the Indian Ministry of Non-Conventional Resources' Integrated Rural Energy Program. On October 6, 2004, MGIRED held its first executive council meeting as an autonomous institute with a new board and senior management, recommitted to its mandate for local-level training in rural energy development in Karnataka and throughout South Asia.

The RDPR intends for MGIRED to play a key role in training the next generation of GP council members, to be elected for 5-year terms in January 2005. To meet this opportunity, MGIRED needs to embark on a crash effort to prepare case studies, curricula and training materials, and trainers ready to establish intermediate capacity at the *hobli* (sub-district) level throughout the state. The GOK has already established a training-outreach capacity statewide and many local governments have shown impressive initiative and accomplishments and RDPR is strongly committed to this effort. So the environment for success is good. MGIRED, by meeting this initial opportunity, could boost its own capabilities and the status of such training efforts throughout the region.

The PRESK approach embraces energy, groundwater, rural governance and agricultural policy within an integrated and interdependent participatory system. It accepts the ideals of privatization, competition, and unbundling of bulk supply to gain efficiencies.²⁸ But it also works directly at the village level to overcome decades of mistrust.

It is becoming clear that neither more power nor better irrigation pump technologies will provide economic salvation for Karnataka's farmers. New, integrated and participatory approaches developed through patient and extensive capacity building among local institutions are needed. Only better awareness, understanding, and decision-making in the hands of those on the ground can adjust to the dynamic and complex changes that are underway, and mobilize individual efforts to meet the community's collective needs, and into a larger consensual process and policy framework.

After a year and a half of working with all stakeholders, observing the results of pilot programs carried out both under the PRESK Pilot Program and related initiatives of others, it is possible to draw some conclusions about what has worked and what is needed if the stakeholders are going to succeed in addressing the state's worsening rural electricity and water issues. The following nine points are a priority short list; they provide a program agenda for the MGIPC. But they also merit attention, commitment, and support by the GOK, and action through specific agencies, including the state's ESCOMs.

- develop information services
- develop integrated information and analysis of rural development issues
- leverage the synergy in co-managing water and energy
- continue to decentralize and devolve electricity services
- improve efficiency of transmission and distribution.
- develop effective local water management units
- promote distributed generation
- facilitate local investment in small-scale, pro-poor infrastructure
- shift to smarter **subsidies**.
- **Continue to develop information extension services**
When asked what they *want*, Karnataka's farmers of course say: "more water," "more electricity," "higher crop prices." But PRESK found that what farmers *need* is actually simply more data, more information, and more reliable facts to help them understand what is going on in their world, and to guide their individual and collective long-term decisions.²⁹ This is true also for the ESCOMs, who do not have quality information even on their own assets, on actual power usage patterns, or customers' accounts. And both sides are nearly ignorant of how each other's business works; farmers have no understanding of how electricity is produced and delivered, and how a utility has to meet the needs of all customers. Similarly, few ESCOM staff has any understanding of how farmers use electricity, and what other factors and constraints affect a farmer's business.

Within the PRESK pilot, several techniques were used with good results:

²⁸ Haldea, G. 6 April 2004 *Unshackle Power Reforms: Focus must shift to the Consumer*. Times of India.

²⁹ Interviews with half dozen KPTCL officials, energy experts, farm surveys, questionnaires.

- A Resource Center (RC) was established at Gubbi, and a mobile unit was later introduced to visit farmers in their villages. The RC, manned by knowledgeable staff, was able to serve as a one-stop focal point for information from several agricultural agencies, and from BESCOM. It quickly became a popular meeting place for farmers to share experience and ideas, as well as to obtain literature or instruction on specific topics.
- A PRESK web site was established, to take basic information gleaned to many farmers and make it widely accessible; a CD version of the site is also available
- From early on, PRESK identified model farms and farmers in the region who were willing to share their success in applying good water and farm management practices, both through lectures at the RC and by hosting study visits by interested farmers
- Informative and motivational films, videos, and booklets
- Training courses for GPs, where they learned the basics of the electricity industry, and about providing rural electricity services

Recommended Next Step:

These informational services are at the core of the training and educational activities planned for the MGIPC, and directly support RDPR's new initiative to establish intermediate-level capacity- building and advisory services, assigning subject matter specialists at the hobli level for working with GP members throughout the state. All of the PRESK training and information services including the Resource Center, the Web Site, Farmer-to-Farmer sharing, educational materials and training courses should be integrated into the new MGIPC. The immediate priority will be to support RDPR's program to provide PRESK training to all GPs statewide in early 2005. The other 3 pilot taluks (Chintamani, Doddebelpur, and Molakalmuru) should each have an RC established to serve the hobli level, and the RC concept should gradually be implemented statewide. The GOK should provide core funding for these information services.

- **Develop integrated information and analysis of rural development issues.**
As resource constraints tighten and the rural economy becomes increasingly dynamic and complex, better information and analysis of information is needed at the macro level also. On the one hand, RDPR is moving to strengthen local-level governance capacity and provide issue-oriented technical support to GPs, which will strengthen day-to-day decision-making at the local level. But the bigger picture also needs to be put together, key trends need to be monitored, likely impacts need to be anticipated, and sound analyses of the evolving trends need to be shared to local leaders. Individual agencies such as the departments of Agriculture, Forestry, Irrigation, Water, Watersheds, Geology, Meteorology, and Health monitor some of these trends for their own sector. But the GOK needs information integrated and assessed in a holistic manner, on a regular basis. The MGIPC could play this role; it fits well with its focus on grassroots, integrated problem solving.

During the PRESK Pilot, an assessment of data sources and capabilities for geographic information systems (GIS) in Karnataka was conducted.³⁰ That assessment concluded that, at modest cost, the MGIPC could establish a small but competent GIS capacity, and undertake

³⁰ Irene Findikaki, "Development of a GIS Application in Support of the Goals of PRESK; Observations Based on Contacts in Bangalore in May 2004," Nexant SARI/Energy, June 2004.

both statewide data integration and an applied pilot program in a selected district. Together with a small team of economist/environmental specialists working on non-GIS data sources (government statistics, market analyses, daily press reports and field surveys), a Rural Development Resources Assessment unit under the MGIPC could significantly boost the ability of both government and private sector to understand and appreciate how and why the rural economy is changing, and where the strategic intervention points are.

There will also be need for GIS services to support anticipated future collaborations between GPs and ESCOMs. As agreements to transfer distribution services are transferred to the GPs, reliable databases with data and maps of local distribution infrastructure and assets will need to be prepared, and validated by the GPs and local farmers. All parties will need to agree on the basic information so that there is a transparent and common framework for collective and participatory decision-making. The RDRA unit could provide these services with specialized competence at reasonable cost.

Recommended Next Step:

RDPR should use the MGIPC for Rural Development Resources Assessment (RDRA), focused on electricity services, groundwater depletion, and related rural development issues. This RDRA would require a handful of staff competent in gathering and analyzing social, economic, and environmental data. Their work should be augmented with GIS capability, in line with recommendations made by PRESK consultants in mid-2004. The initial effort would be to integrate efforts across sectors and government departments. Periodically, workshops of experts could be convened, both to review the general situation and to address specific topics such as drought warning systems. Analyses should be prepared on a semi-annual and annual basis, for use by government planners and policy makers, and shared broadly with the public. A priority topic should be to follow up on the PRESK Pilot farmer surveys to assess the income and ability to pay by farm households.

▪ **Leverage the synergy in co-management of water and energy**

As described in Part 2 of this paper, there are powerful synergies between agricultural water management and rural energy services. The problems reinforce each other; therefore solutions to these problems need to be designed to reinforce each other.

The MGIPC should target research on these energy-water synergies, and aim to link the efforts of different agencies such as the Water and Watershed departments with those of the ESCOMs. For example, information about lowering water tables and aquifer depletion need to be understood for their impacts on electricity demand levels and load patterns.

Energy-water synergy issues should be the central focus of MGIPC's research program. Each issue can leverage the other, and no other agency or organization has a mandate to consider these issues jointly.

Recommended Next Step:

The MGIPC should set an agenda for energy-water synergy research, aiming to complete at least one significant applied research program on these issues each year. A good first topic would be to build on the PRESK Pilot research, and develop water values for all of the Karnataka's major crops.

- **Continue decentralization of rural electricity services**

RDPR and the ESCOMs need to continue their efforts to decentralize the management of electricity services to GPs and other local entities. The PRESK Pilot has brought a number of GPs to the point where they are ready to commit to taking on billings and collections, and eventually to oversee all aspects of providing local electricity services.

The first priority is to develop a comprehensive trial program in a single GP, to serve as a model for others to see and learn from

Recommended Next Step:

The MGIPC needs to follow through on signing and implementation of the draft PRESK MOU for takeover of electricity distribution services with at least one GP or a set of GPs. They will need to work closely with BESCOM to assure that necessary upgrades are made for the distribution system in the areas handed over, and to assure secure and adequate power supply.

- **Improve Local T&D efficiency**

Under the PRESK Pilot, an analysis was made of the opportunity for ESCOMs to work through district-level Technical Support Groups to apply sound maintenance and expansion techniques that could reasonably reduce technical losses on rural feeder lines by 20 percent and more.³¹

Such local technical support groups could readily be a part of the decentralizing of management of rural energy services with individual GPs. Drawing upon expertise that is resident within the district, wherever possible, will help to assure a match of technological knowledge with local familiarity, which is important in adapting to each locality.

Recommended Next Step:

As GP-level PRESK MOU projects materialize, the MGIPC should work with the ESCOM and the GP to establish District Level Technical Support Groups to advise on priorities for maintenance and expansion, and to assure that needed system upgrades are provided. The district-level Technical Support Group should work with the GPs and the ESCOM as outlined in the PRESK report to identify priority needs for maintenance of the feeder line and distribution network. It may be that there is no one within the district itself with the technical qualifications needed, in which case the MGIPC could arrange for such expertise from outside.

- **Work to develop effective local water management units**

Under the PRESK Pilot, considerable effort was devoted to working with farmer groups and seeking an effectively scaled unit for effective local groundwater management. It is a difficult issue. Unlike surface watersheds, the physical boundaries and dimensions of underground aquifers and water flows are uncertain at best. So it is difficult to define the physical boundary for a community of users for a given underground source. Socio-economically, it is also difficult to organize neighboring farmers around this issue. Their

³¹ V. Venkata Subbarao, "Options for System Upgrades for Rural Power Distribution Networks," Nexant SARI/Energy, March 2004.

relative status and level of income give them very different options and conflicting stakes in tapping and using the groundwater below them. But at the same time, groundwater is an unregulated and unpriced good. And it is very difficult to regulate or to price groundwater in a commercial sense.

Only when the “community of users” share a common understanding of the value of the water to them collectively as well as individually would it be possible to make a “technically sound” judgment of how best to allocate it among themselves. The PRESK Pilot achieved this pretty well in at least one community for at least one season,³² but such an effort is not sustainable over a larger scale.

Aside from the PRESK Pilot, there are various efforts by donor agencies, NGOs, and community organizations, and the state government itself, to develop groups to promote water conserving farming, water harvesting, or groundwater restoration activities should all certainly be encouraged, and positive results should be identified and publicized. But in the context of future PRESK work, the most sustainable, and probably socially most efficient course, will be to support the GP’s themselves to promote efficient use and equitable sharing underground water within their communities. The GPs have a universal presence and structure for such efforts, and it will be a natural complement to their efforts to take on local electricity distribution management.

These efforts at effective local management of groundwater are important also to the lingering issue of water rights and regulations. A draft national groundwater policy has been pending for nearly three decades, and it is easy to despair of progress to establish legal rights for groundwater. Although there are constitutional grounds for developing a system of groundwater rights, the legal issues reflecting the biophysical and socioeconomic challenges discussed above are seemingly intractable. The topic is worth a mention here, however, because Indian legal scholars recognize that “What is required is a decentralized planning of groundwater law appropriate to each specific State context ...the planning of groundwater law should itself be a participatory exercise.”³³ Given the increasing pressure on underground water resources in Karnataka, the next stage of PRESK work with the GPs is likely to have good practical impact on future deliberations at state and national level.

Recommended Next Step:

MGIPC should work with interested GPs to establish GP committees dedicated to productive and equitable water use and conservation in their communities. These committees could, with guidance and technical support from the Resource Centers and other MGIPC resources, contribute to monitoring of local groundwater levels, improved (more efficient and productive) groundwater use, and assure that all social groups and community members have access to basic supplies.

■ **Promote distributed generation**

Worldwide, distributed generation has become a hot issue. Distributed generation (dis-gen) allows utilities or users to produce electricity in scaleable units near its point of use,

³² James Stephens, PRESK Energy - Water Nexus report, Nexant SARI/Energy, July 2004

³³ M.S.Vani, “Sustainable Groundwater Legislation,” Paper presented to Annual Conference of the National Geological Society of India, Hyderabad, October 2001; Development Centre For Alternative Policies, New Delhi

changing the grid from a centralized one-way flow to an interactive electricity highway. Alternatively, distributed generation can supply isolated or remote communities from their own off-grid power source, rather than sinking investment into costly T&D lines. Dis-gen holds great promise for Karnataka, where there should be many good opportunities for small-scale hydro and biomass-fueled generation at the local level and where most rural feeder lines run too far from the centralized generation points to carry full power. But these smaller, local units pose their own sets of problems – environmental, social, organizational, as well as technical.

Distributed generation is sure to be a primary focus of MGIRED's work. The MGIPC should actively monitor and document the progress of dis-gen projects in rural Karnataka. It is important that these early experiments in decentralized generation be understood and made accessible to the GPs and others engaged in decentralized distribution.

Recommended Next Step:

The MGIPC should play a leading role in monitoring and promoting distributed generation projects in rural areas. General information needs to be gathered and provided to GPs and the public. Proposed projects need sound financial analysis. Projects underway need monitoring, documentation, and sharing. It may also be appropriate for the MGIPC itself to identify and conduct one or more pilot projects.

▪ **Facilitate local investment in small-scale infrastructure**

Under the PRESK Pilot, the Small-Scale Sustainable Infrastructure Development Fund (S³IDF) was supported to facilitate some small-scale pro-poor energy projects in the four PRESK Pilot taluks. S³IDF identified promising opportunities and then carried out extensive pre-investment assessment and documentation for those that appeared viable. Within the pilot period of PRESK, they were able to develop several of these projects to be “ready for implementation,” and will continue to develop other projects in their growing portfolio of more than a dozen such projects. Several are already in or near implementation, drawing mainly on funding from local banks and “gap-filling” financial support from S³IDF's revolving fund. The S³IDF innovative financing facilitates local bank support for small pro-poor projects that are viable but not bankable under the banks' current business as usual practices. There appears to be both need and opportunity to extend this kind of small-project development and financing on a broad scale throughout the state.

Recommended Next Step:

The MGIPC should work with S³IDF, central authorities, and local financial institutions to promote awareness of innovative financing techniques and priority financing opportunities in the local energy market. Documentation, training, and promotion are all needed, including presentation of this information on the PRESK website and active work with banks within the taluks.

▪ **Shift to smarter subsidies**

Finally, there are tremendous opportunities and great need to reorient and revitalize the GOK's investments in rural development by shifting to smarter subsidies.

A basic issue is the question of working through demand side subsidies instead of from the supply side. Supply side payments go directly to the supplier on behalf of the beneficiaries. This is the case throughout the Indian power sector today. ESCOMs or SEBs are paid directly by the state government to compensate for low rates (and non-payments) of agricultural and low-income customers. In principle, demand side subsidies should be far more effective; by providing direct support to the consumer or beneficiary (farmer), the subsidy can be used to pay for services from the customer's side, which in theory should provide "better" economic signals to the suppliers.

Supply side subsidies tend to reinforce the status quo. If the supplier is paid for delivering X amount of energy, it does not really matter to him whether the transmission and distribution system is efficient and well maintained, the pilferage is high, the power's quality is adequate, or the power provided goes to productive uses. In contrast, demand side subsidies, allocated to the consumer, and then used by the consumer to pay the supplier, provide a positive reinforcement to the system; the supplier has direct incentive to understand and respond to the needs of the consumer.

Demand side subsidies can also be used to reinforce socially desirable behavior on the part of consumers. For example, farmers within a targeted watershed or along a given power feeder could be given vouchers covering all or part of their electricity bills in exchange for shifting to less water-intensive crops. The ESCOM would get paid for power it supplies but would need to supply less to these farmers, saving electricity, which can be sold to industry. And the rate of local groundwater extraction would be reduced.

Demand-side subsidies, however, are much more difficult to manage; they require a capable, transparent, and effective delivery mechanism to provide the subsidy directly to the beneficiaries. With the rapid development of local governance capacity, Karnataka is arguably reaching the stage where demand-side subsidies could be administered effectively.

Other key subsidy issues of immediate relevance to improving rural electricity services in Karnataka include:

- the need to shift public investment to support local water and energy management initiatives;
- coordination of agricultural and electricity subsidies;
- promising innovations in flat rates, transformer-based metering, etc.; and
- direct support for the agricultural transition – helping marginal farmers to move to other sectors

Durable transformation can take place only if and when energy subsidies and agricultural incentives authentically 'devolve' down. Rather than 'push' competition of central supply production from the top, these subsidies could be judiciously retargeted to 'pull' competition of diverse local demand reduction from the bottom and stimulate development of new distributed sources. Subsidy devolution from supply to demand could reverse incentives back up the supply chain: less suicides, recharged aquifers, 'drought-proof' crops, efficient electricity transmission and distribution. Devolution of energy subsidy from central supply to local demand can potentially unlock robust, politically painless, and voluntary resource efficiency.

As GPs and other local entities take on the “license” for electricity distribution within their district, they will need to understand and apply both tariff and subsidy issues clearly. Similarly, as these districts become self-reliant in energy services supply and payment, the state will be interested in properly and equitably reducing its subsidies to the “newly independent” districts.

Recommended Next Step:

MGIPC should be made the state’s focal point for monitoring and analyzing the impacts of energy and agricultural subsidies, and for policy research on improving these subsidies and their delivery. The state should actively experiment with alternative subsidy packages in different districts, with MGIPC doing the monitoring and assessment work that can provide quick feedback on impact and results.